

HEMP BENCHMARKS®

U.S. Wholesale Hemp Price Benchmarks

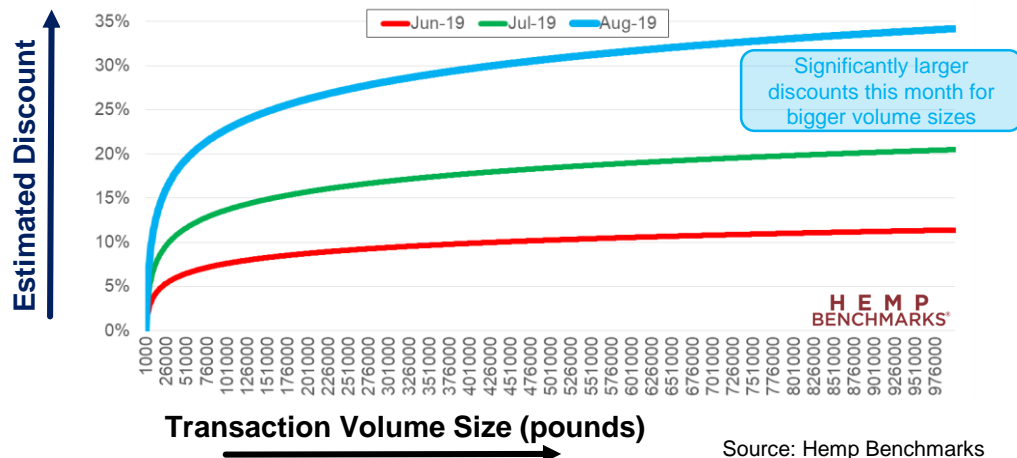
August 2019

U.S. Region Products	Units	Assessed Price	Low	High
Biomass (0 – 25k pounds)	\$ / %CBD / pound	\$3.80	\$2.10	\$5.80
Biomass (25k – 100k pounds)	\$ / %CBD / pound	\$3.10	\$2.25	\$4.17
Biomass (100k – 1M pounds)	\$ / %CBD / pound	\$2.96	\$2.05	\$4.17
Biomass (1,000,000+ pounds)	\$ / %CBD / pound	\$2.95	\$2.20	\$3.75
Dry Flower (Bulk)	\$ / pound	\$414	\$100	\$700
Clones	\$ each	\$4.67	\$3.00	\$10.00
Industrial Seeds	\$ / pound	\$8.60	\$3.96	\$15.00
CBD Seeds (Non-Feminized)	\$ / pound	\$2,460	\$2,300	\$2,500
CBD Seeds (Feminized)	\$ / pound	\$24,600	\$20,000	\$28,820
Crude Hemp Oil	\$ / kilo	\$2,309	\$1,350	\$5,300
Refined Hemp Oil	\$ / kilo	\$5,475	\$2,317	\$11,000
CBD Isolate	\$ / kilo	\$4,477	\$3,550	\$6,500

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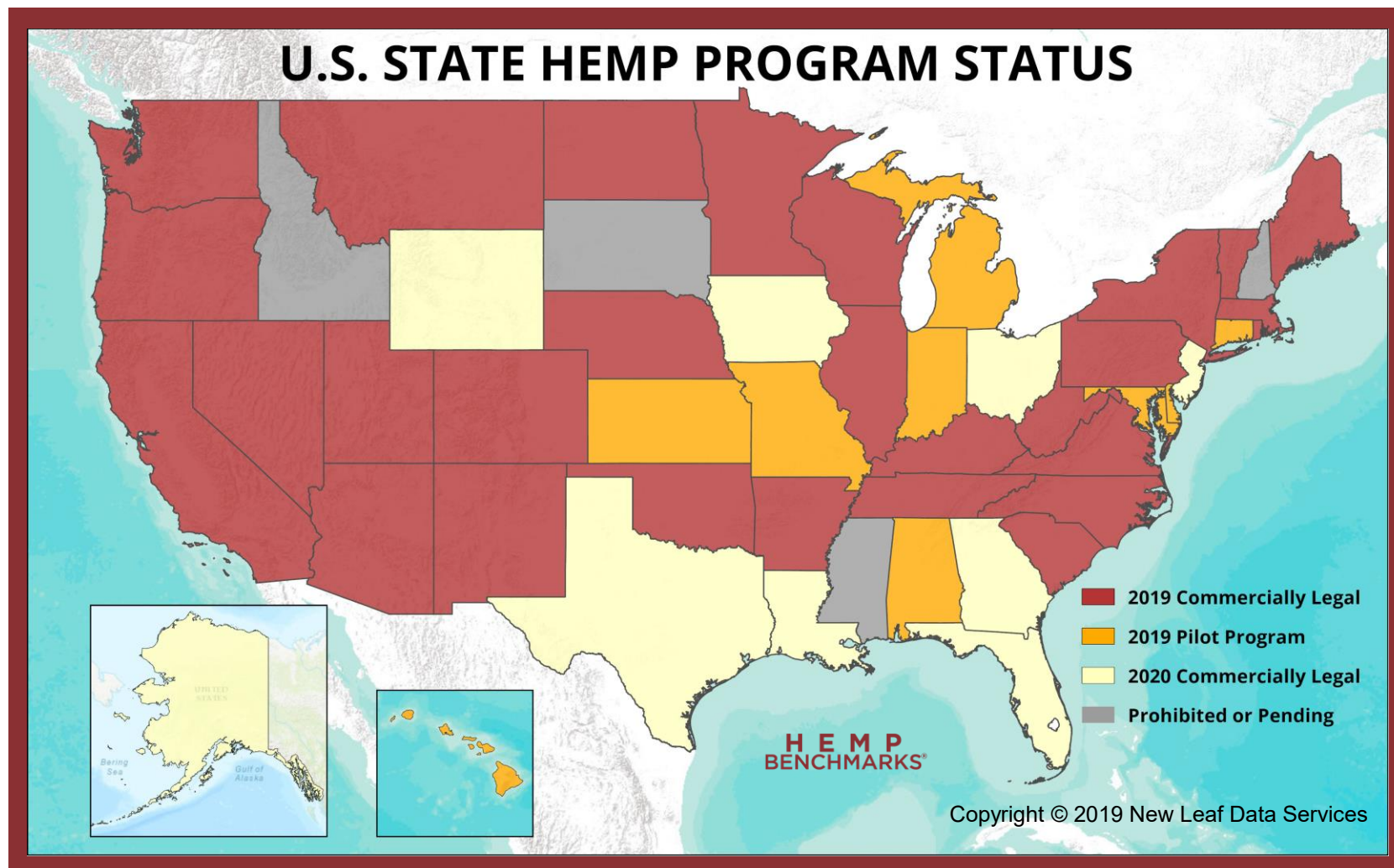
U.S. Biomass Volume Purchase Discounts



Commodity market participants benefit from increased price transparency.

Hemp Benchmarks® is an independent Price Reporting Agency (PRA). Our goal is to bring price transparency to wholesale hemp markets in order to allow businesses to operate with confidence and efficiency.

We do not have physical or financial exposure to the commodities that we assess, and therefore do not profit from liquidity, volumes or price movement, avoiding the potential for any perception of conflicts of interest that could arise for marketplaces and exchanges.



U.S. Price Commentary

Wholesale prices continued to erode for the most part in August, with only a few product categories seeing increases.

Biomass prices persisted in their downward slide this month, with discounts on larger volume deals (25k+ pounds) declining by at least 9.1% from July's price assessments. Feedback from our Price Contributor Network indicates that lower biomass prices ahead of the September harvest are due to producers looking to get rid of old plant material, much of which was of lower quality already, on top of seeing its CBD potency degrade over the course of the past year. CBD Seeds, particularly non-feminized, also saw a sizeable decline in price in August. At the moment, farming operations are focused on the upcoming harvest and demand for seeds is low.

Product	Units	Apr 2019	May 2019	June 2019	July 2019	Aug 2019	MoM \$Chg	MoM %Chg
Biomass (0 – 25k pounds)	\$ / %CBD / pound	\$4.46	\$4.05	\$4.02	\$3.91	\$3.80	(\$0.11)	-2.8%
Biomass (25k – 100k pounds)	\$ / %CBD / pound	\$3.72	\$3.70	\$3.61	\$3.41	\$3.10	(\$0.31)	-9.1%
Biomass (100k – 1M pounds)	\$ / %CBD / pound	\$3.66	\$3.59	\$3.57	\$3.27	\$2.96	(\$0.31)	-9.5%
Biomass (1,000,000+ pounds)	\$ / %CBD / pound	\$3.46	\$3.42	\$3.52	\$3.32	\$2.95	(\$0.37)	-11.1%
Dry Flower (Bulk)	\$ / pound	\$326	\$320	\$349	\$352	\$414	\$62	17.6%
Clones	\$ each	\$5.95	\$5.70	\$5.42	\$5.13	\$4.67	(\$0.46)	-9.0%
Industrial Seeds	\$ / pound	\$1.83	\$2.39	\$2.68	\$7.21	\$8.60	\$1.39	19.3%
CBD Seeds (Non-Feminized)	\$ / pound	\$5,938	\$3,833	\$3,611	\$3,490	\$2,460	(\$1,030)	-29.5%
CBD Seeds (Feminized)	\$ / pound	\$25,347	\$23,716	\$24,491	\$25,504	\$24,600	(\$904)	-3.5%
Crude Hemp Oil	\$ / kilo	\$4,661	\$2,409	\$2,066	\$2,238	\$2,310	\$72	3.2%
Refined Hemp Oil	\$ / kilo	\$7,197	\$6,599	\$5,628	\$5,451	\$5,475	\$24	0.4%
CBD Isolate	\$ / kilo	\$6,077	\$5,552	\$4,811	\$4,574	\$4,478	(\$96)	-2.1%

Source: Hemp Benchmarks®

Become a Member of our Price Contributor Network

Join us in our mission to promote price transparency and receive exclusive content and analysis made available only to members.

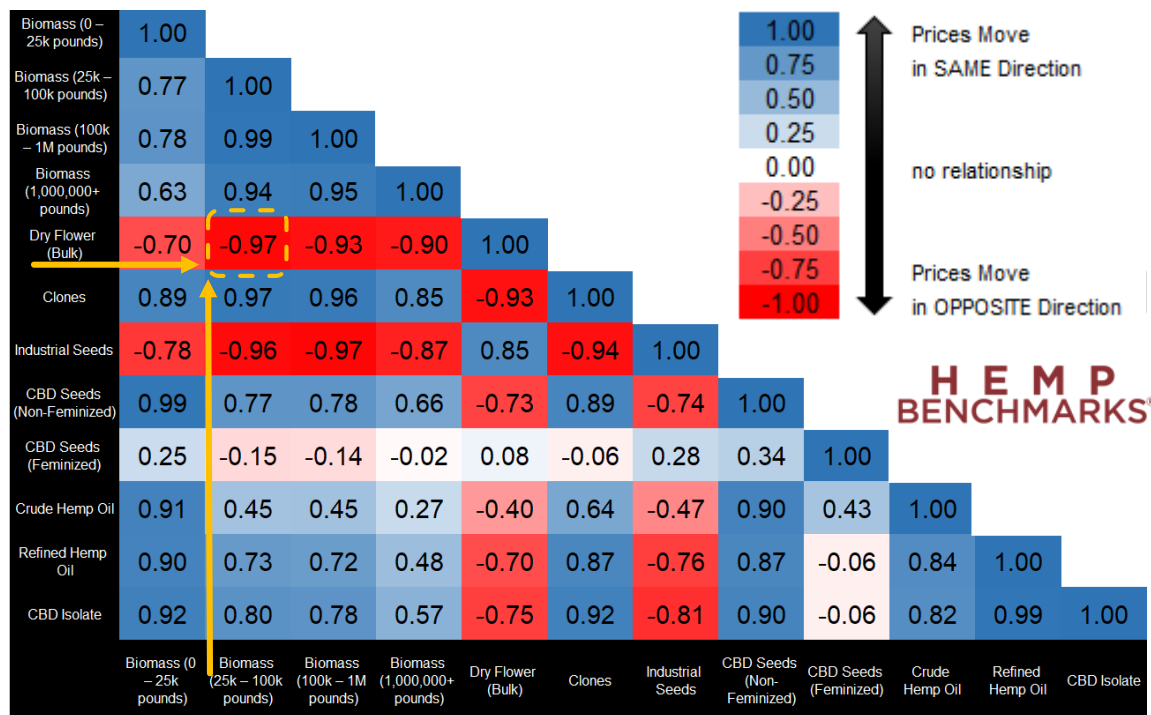
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H E M P BENCHMARKS®

U.S. Wholesale Hemp Price Benchmarks

August 2019

Wholesale Prices - Correlation Matrix



What does this mean?

This wholesale price correlation matrix was generated from historical Hemp Benchmarks price assessments. It shows which product prices move together, move in opposite directions, or have no relationship at all.

Correlations range from 1 to -1. If two products have a perfect positive correlation coefficient of 1, then the prices for each have been observed to move in the same direction, either up or down, by the same magnitude. A perfect negative correlation of -1 means that prices for two products move in opposite directions. A correlation of 0 indicates no relationship at all.

Interpretation

The correlation matrix shows most product prices are positively correlated, indicating that they generally move in unison and the hemp value chain is highly interconnected. The exceptions are Dry Flower (Bulk) and Industrial Seeds, which show strong negative correlations. In other words, as prices have been deteriorating for most products, rates for these two product types have been on the upswing.

Example:

The correlation between Dry Flower (Bulk) and Biomass (25k-100k pound transaction size) is -0.97. This means that, based on current available data, the prices of these two products have almost always moved in opposite directions by nearly the same magnitude month-to-month.

Mixed Expectations Ahead of the 2019 Hemp Harvest

U.S. farmers are preparing to harvest - or in some cases are already harvesting - the nation's first federally-legal hemp crop in decades, following the passage of the 2018 Farm Bill. This historic milestone comes as a growing number of consumers are seeking out products made from the plant, especially hemp-derived cannabidiol (CBD).

However, as one might expect in a new industry, the 2019 hemp harvest is being complicated by a wide variety of issues. Hurdles that hemp farmers have faced this year include weather extremes, pests and disease, general unfamiliarity and unexpected developments with the new crop, and a supply chain fraught with potential hurdles and bottlenecks.

Taking the aforementioned difficulties into account, in what follows we provide an estimate of how much hemp biomass will be harvested in 2019 and its market value at various potential price points.

Finally, the regulatory foundation undergirding America's newly-legal hemp industry remains under construction. Federal rules are still being formulated, while state and local governments are taking various approaches to overseeing hemp cultivation and the products derived from the plant.

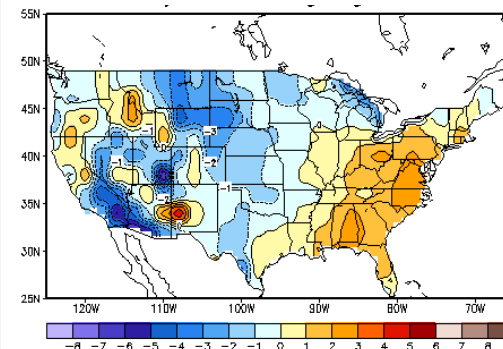
Weather & Crop Reports

It has been a very unsettled season so far this year for American farmers. A cold and wet spring in many parts of the country gave way to record-breaking summer heat. The map below shows how temperatures across the U.S. departed from historical averages.

Multiple market participants in Colorado stated to Hemp Benchmarks that the inclement spring and early summer weather in the state resulted in some licensed acreage not being planted, while others experienced crop loss. A Colorado processor said that he had heard of some growers re-planting as late as this month in an attempt to salvage some return from the season.

Farmers in other parts of the country have reportedly had similar experiences. "Hemp planting was kind of difficult this year," Jay Berry, a farmer in Marion, Indiana who is growing 100 acres as part of his state's research trials, told Agrinews in early August. "We literally have only had half an inch of rain since we planted. We went from one extreme to another. I think that's hurt it a little bit."

U.S. May-June-July Weather Anomaly



Source: [National Weather Service](#)

On top of that variability, some hemp farmers are also coping with other harsh and extreme weather conditions. For example, in central Oregon, areas of Deschutes County, which contains the third most registered hemp farms of any county in the state, were hit by severe hail storms in early August. A report at the time from local outlet KTVZ stated that early estimates were that 500 acres of industrial hemp had been damaged or destroyed.

However, as is often the case in the western U.S., severe weather can be highly localized. One Oregon grower operating in the area told Hemp Benchmarks that his crops were undamaged, but that a nearby farm lost everything to the hail and another lost about 60% of its hemp crop.

Overall, though, with over 60,000 acres licensed for hemp cultivation in Oregon, 500 acres represents less than 1% of statewide production capacity. An August 20 report on the hailstorm from Oregon Public Broadcasting quoted Matt Cyrus, president of the Deschutes County Farm Bureau. Cyrus stated of the hail, "On an individual basis it's devastating, but from an industry standpoint it will have no impact on the market."

In addition to difficulties with weather, some farmers are facing pest and disease pressures. A registered hemp grower reported to Hemp Benchmarks earlier this month that 7,000 acres of hemp being grown near Delta, Colorado was afflicted by an unidentified fungus. Hemp has been touted as resistant to many pests and pathogens that affect other crops, but it is likely that insects, fungi, and other pests will adapt to the plant's defenses and present

additional challenges to cultivators this season and in years to come.

Indeed, some North Carolina hemp farmers are reportedly seeing their crops afflicted with "a leaf spot issue that is caused by *Exserohilum rostratum*," according to the North Carolina State University (NCSU) Extension. The Extension report published earlier this month says that the disease has been observed in several varieties of industrial hemp across the state.

Another report from the NCSU Extension this month states that, "Root, crown, and stem rots are being observed in industrial hemp stands across North Carolina." Specifically, hemp farmers in the state are seeing *Fusarium* wilt and crown rot, Southern blight, and *Pythium* root rot. Each of the afflictions named typically comes about in overly wet, humid conditions, according to the NCSU Extension, which heavy early-season rains created this year.

Meanwhile, humid and wet conditions in Wisconsin are causing diseases such as downy mildew to break out on industrial hemp crops, according to an August 16 report from SWNews4U. The report also quoted a state agriculture official as saying that Wisconsin hemp farmers are dealing with pests such as the Eurasian hemp bore, cannabis aphid, and flea beetle.

While difficulties have been myriad this year, some hemp farmers have reportedly made it to this point in the season relatively unscathed. The operator of a large growing operation in northeastern Colorado stated to Hemp Benchmarks that as of mid-August he had not had any problems related to weather or pests, and that his crop was doing well.

Looking ahead, the latest month-long weather forecast, issued in mid-August by the National Weather Service's Climate Prediction Center, indicated above-normal temperatures for the Western Continental U.S., from the Pacific Coast to the Rocky Mountains, into September. Higher-than-normal temperatures are also expected during that time period across the Southwest into Texas, in the Southeast from the Appalachian Mountains eastward to the Atlantic Coast, as well as in the Northeast and into the northern Great Lakes region.

Above-normal precipitation is considered likely in September in the North-Central Continental U.S., possibly extending into parts of Colorado and the Central Plains.

Damaging storms from hurricanes, meanwhile, are always a wild card at this time of year along the Eastern Seaboard. An August update from the National Oceanic and Atmospheric Administration says the likelihood of an above-normal Atlantic hurricane season is currently at 45%, up from the 30% outlook issued in May. We are currently entering the hurricane season's peak months, which span from August through October.

Supply Levels Opaque as the Hemp Rush Continues

Despite the risks, many hemp cultivators and manufacturers apparently remain optimistic. However, the tribulations noted above, as well as other factors, may result in less than ideal outcomes for some market participants this year. In many of the states with new hemp programs there is, in the words of one East Coast agriculture official, "a lot of excitement but ... a steep learning curve."

Even in states where growers have years of experience with hemp, weather concerns and other issues have resulted in uncertainty and lowered expectations. One of the founders of a large, vertically integrated hemp farming and processing operation in southeastern Colorado told Hemp Benchmarks, "We think because of the cold and wet spring ... and various other challenges, that the harvest in Colorado will be about 20-30% [of the over 80,000 acres licensed for hemp cultivation]." He went on to say that he does not think that harvest figures last year were as high as reported, and he believes that tighter-than-expected supply of biomass this fall will push up prices for such material.

Yet, conflicting reports from other market participants emphasize the need for greater transparency in America's developing hemp industry. A Denver-area processor stated to Hemp Benchmarks this month that 6.5 million pounds of biomass sits baled and unsold at an affiliated farm in Montana, but its CBD potency was not very high and had degraded since last year. Overall, he stated that biomass with good CBD potency was hard to find as of early

August and, while it is difficult to determine definitively the level of supply available, he was worried that this year's harvest would result in a large surplus.

There are also a substantial number of first-time farmers reportedly trying their hand at hemp, adding further uncertainty to this season's overall outcome. Established farmers of traditional crops, but who are new to hemp, are entering the market searching for a potentially lucrative alternative revenue stream, especially as markets for numerous agricultural commodities have been battered by ongoing international trade disputes. Adding insult to injury, prices for corn and wheat dropped in August after the U.S. Department of Agriculture (USDA) predicted a rise in production for those staples relative to more conservative estimates issued earlier in the year.

A mid-August report from the Winona Post provides an example of such activity. According to the report, "poor prices for traditional crops have Minnesota farmers willing to try new things," namely hemp. Farmers in Minnesota are reportedly cultivating hemp in 82 of the state's 87 counties this season, wooed in part by accounts that some growers have earned tens of thousands of dollars per acre for hemp grown for CBD.

While hemp biomass prices might be more stable at the moment than some of the staple grains with their nearly constant price fluctuations, concerns regarding supply levels are not limited to market participants. "I've supported the legalization of hemp for 20 years, but I am nervous about what's going on," Minnesota Congressman Collin Peterson, who chairs the U.S. House

Agriculture Committee, told KARE, a Minneapolis NBC affiliate, in August. "If everybody grows hemp that's talking about it, you will collapse that market and screw that up."

Even official data comes with significant caveats. Earlier this month, several outlets reported on data from the USDA Farm Service Agency's (FSA's) monthly "crop acreage" summary. According to the FSA's summary, the amount of acres planted with hemp in the U.S. has more than quadrupled over the past year, from 27,424 in August of 2018 to about 128,300 this month.

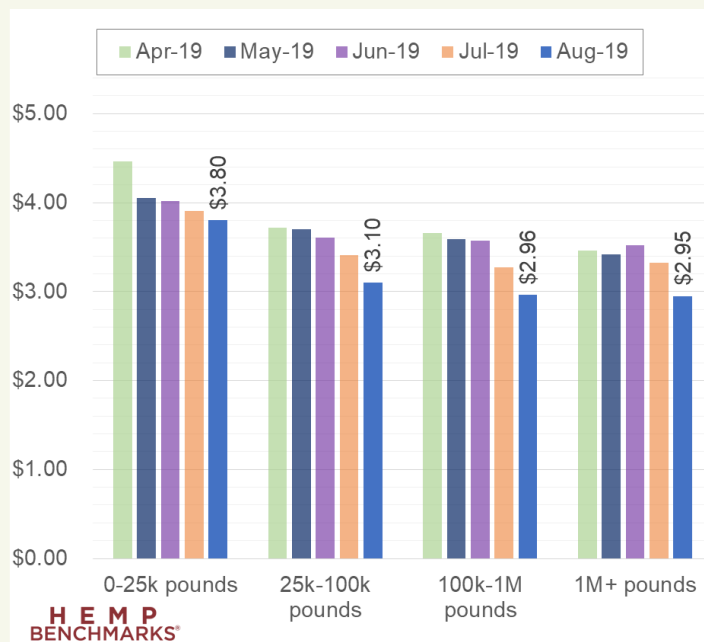
However, Bill Richmond, chief of the Agricultural Marketing Service's Hemp Program at the USDA, emphasized to Hemp Benchmarks that the FSA figure is not intended to represent total acreage of hemp planted in the U.S., while pointing out that the FSA data includes an explicit disclaimer to that effect.

According to Richmond, existing farmers that are already reporting their planted crops to the FSA will provide information on all crops planted, including hemp, and that reporting the FSA's figure as the total amount of hemp planted in the U.S. is incorrect.

Indeed, the figure documented by the FSA represents about 27% of the roughly 475,000 acres licensed for growing hemp outdoors counted by Hemp Benchmarks and detailed in the table on page 18.

Other industry observers, such as Vote Hemp, employ the assumption that 70% of the acreage licensed for hemp farming is planted in any given year. Don Robinson, the seed administrator at the Office of the Indiana State Chemist (OISC), was quoted in an August report from Agrinews as stating, "What we are finding across the country is roughly 50% to 70% of proposed hemp grow sites are planted."

U.S. Hemp Biomass Monthly Pricing (\$ / %CBD / lb)



Estimates of Biomass Yield & Value from 2019's Harvest

In light of the large increase in the acreage that has been licensed for hemp cultivation this year - which is more than four times that permitted in 2018 - some market participants, as well as the USDA, have expressed the concern that there will be a glut of biomass after the fall harvest, resulting in significantly lower prices for such plant material, as well as for bulk oil, distillates, and isolate. As can be seen in the chart on the left, prices for hemp biomass have already been falling in recent months.

For this month's report, Hemp Benchmarks examined a range of possibilities in order to arrive at an estimate for the amount of biomass that will be harvested this year for the purpose of producing CBD, in addition to the value of that biomass at today's prices, as well as at depressed rates anticipated by market participants in the wake of the harvest.

In developing our analysis, we made a number of informed assumptions. While there is no hard data to back up the assumptions due to the novelty of the industry, we have formulated and tested our assumptions with collaboration from experienced market participants and representatives from a number of state agriculture departments.

We start with the roughly 480,000 acres permitted for hemp cultivation in the U.S. this year, as shown in the table on page 18. We assume that 50% to 60% of the permitted acreage was actually planted, or between roughly 240,000 and 288,000 acres.

As noted above, the USDA recently published information showing that farmers reported planting about 128,300 acres of hemp as of the beginning of August. Again, though, the farmers who report to the USDA FSA are generally well-established operators that grow a broad range of crops. Such farmers constitute a subset of hemp growers that does not include those cultivating only industrial hemp, so the report is neither definitive nor complete.

Still, the USDA Report shows that this subset of farmers planted almost 20,000 of the over 80,000 permitted acres in Colorado and roughly 15,000 of the 56,000 permitted acres in Kentucky. We expect that some of the larger, more established markets like Colorado, Oregon, and Kentucky may have a higher percentage of planted acreage than our overall estimate for the U.S.

On the other hand, many of the newer states that experienced delays in permitting and without established producers will likely have a significantly lower percentage of their licensed acreage planted. For example, in one of the few states that track planted acreage during the season that also has a relatively newer, less developed hemp program, roughly 10% of the permitted acres were planted, according to a source who wished to remain anonymous due to sharing non-public information.

After assessing planted acreage, we assumed that 90% of the hemp crop planted in the U.S. is for CBD (and other cannabinoids), resulting in 216,00 to 260,000 acres of hemp biomass being grown for that purpose.

Based on observations from last year, we assume that only 40% to 50% of the hemp planted will be harvested and suitable for processing, with the rest lost to a combination of poor weather, pests and disease, seed failure, plants that test “hot” for THC, plants with very low levels of CBD, and bottlenecks in the supply chain for harvesting, drying, storing, and processing biomass. This results in a range of between about 85,000 and 130,000 acres harvested successfully.

We then assumed that each acre produces 1,000 pounds of hemp biomass on average. Based on discussions with market participants and regulators, yield per acre generally ranges from 500 to 2,200 pounds, depending upon plant genetics, climate and soil conditions, and the experience of the farmer, with 1,000 pounds per acre a conservative but reasonable assumption.

Accordingly, we can estimate that between roughly 85 million and 130 million pounds of biomass suitable for CBD extraction will be generated by American hemp farmers this year.

Assuming an average potency of 8% CBD and a market price of \$3.50 / %CBD / pound, a rate that corresponds generally with current observations for deals involving up to 100,000 pounds, the harvested hemp biomass would have a market value of between about \$2.4 billion to \$3.6 billion.

However, many hemp market participants expect that prices for biomass will deteriorate in the wake of the fall harvest.

If we hold our assumption of 85 million to 130 million pounds of biomass at an average CBD potency of 8% constant, but vary the average price points for which it might sell, then estimates for the market value of U.S.-produced hemp biomass for CBD production in 2019 would be as follows:

U.S. Produced Hemp Biomass Estimated Market Value By Product Price

- \$3.00 / %CBD / Pound : \$2 Billion to \$3.1 Billion Market Value
- \$2.50 / %CBD / Pound : \$1.7 Billion to \$2.6 Billion Market Value
- \$2.00 / %CBD / Pound : \$1.4 Billion to \$2.1 Billion Market Value

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In next month's report, we will provide estimates on the amount of crude CBD oil, as well as CBD distillate and isolate, that could conceivably be produced from the amount of biomass that we believe will be harvested this year, as well as its market value.

Although the focus in many states is cultivating hemp for CBD, there is still substantial acreage designated for hemp fiber and grain. For example, in Kentucky last year only 61.5% of the hemp crop was for CBD. In Indiana this year only 30% of the 5,300 permitted acres were designated for CBD cultivars.

Based on our estimate of acreage harvested successfully this year, the modern U.S. hemp industry is approaching the scale of the historical one. A June 2018 report from the Congressional Research Service states U.S. hemp production peaked previously

in 1943 when 146,200 acres were harvested, generating about 140 million pounds of fiber and 10 million pounds of seed.

Advantages & Disadvantages of Autoflowering Cultivars

Complicating exercises like the one just undertaken are the facts that farmers across the country of course experience varying weather conditions, as well as possessing different amounts of know-how and resources. Additionally, not all hemp cultivars are uniform; yield and CBD potency can vary widely, even between two crops of the same variety grown by different farmers in separate parts of the country. Furthermore, some cultivators have reportedly been experimenting with varieties that are referred to as "autoflowering," which present a whole different set of considerations.

Unlike most varieties of hemp (and cannabis, for that matter), autoflowering cultivars automatically switch from vegetative to flowering stage depending on the plant's age. For example, an autoflowering variety might begin to flower a month after it is planted, regardless of the time of year.

This contrasts with full-term crops, which begin to flower due to increased darkness from lengthening nights in the late summer and early autumn. Additionally, hemp (and cannabis) plants can be forced to flower indoors, or in greenhouses or hoop houses, by exposing them to darkness for at least 12 hours daily, mimicking the shortening days that encourage outdoor-grown plants to flower naturally.

One of the advantages of autoflower varieties is an early harvest, often weeks - or even months - ahead of traditional hemp. "There's a lot being planted here," said an Oregon grower who's familiar with his state's hemp industry. "Seventy acres were harvested as of late July." Another grower and broker in the Northwest says a lot of hemp farmers in his region are buying autoflower seeds and have been planting their hemp crops relatively late.

Bringing in a summer crop can be desirable in order to generate a fresh supply of biomass ahead of the fall harvest, when many expect the market to be flooded with such plant material. However, cultivating autoflowering varieties is not without risks. One of the potential drawbacks with autoflower hemp plants is that they sometimes flower before growing to a significant size, resulting in dwarf plants that have low yields.

"You end up with plants that are two feet tall, and harvest one to three ounces of dried plant material," the Oregon grower quoted just above told Hemp Benchmarks. Contrastingly, "A full-cycle plant will produce between 1.5 and 3 pounds depending on the strain."

The risks of autoflower genetics described above, combined with falling biomass prices and generally increased production, can create a "catastrophic" scenario for many growers where they fail to recover their initial costs, the Oregon farmer said. "There are some people still trying to put plants in the ground," he continued, while noting that some hemp growers stand to lose hundreds of thousands of dollars on their investments. He also suggested that

industry observers might see a very "uneven" hemp harvest across the U.S. over the next several months.

Whether autoflowering varieties become a significant part of U.S. hemp production remains to be seen and likely depends on whether standardized cultivars that consistently produce acceptable yields can be developed. Otherwise, as we pointed out above, early harvests can be achieved in a less risky manner by growing full-term varieties and forcing them to flower via light-deprivation, which has been the preferred approach of many cannabis growers on the West Coast for some time.

Supply Chain Hurdles

Getting industrial hemp biomass from the farm to processors requires clearing numerous hurdles, which can present significant issues for market participants. Additionally, the realm of growing hemp for fiber and textile production has been presenting its own unique complications for farmers and others in the supply chain.

The operator of a large hemp farming operation in northeastern Colorado, quoted above, told Hemp Benchmarks he remains very concerned about several issues critical to efficient hemp production.

One is finding sufficient manual labor. Weeding and harvesting a large hemp crop requires a significant amount of workers, and a number of sizeable hemp producers are reportedly dealing with labor shortages. An August 1 report from WMTV, a local news outlet in Wisconsin, also told of a labor shortage amongst hemp farmers in that state. The report quotes a Wisconsin hemp producer as stating that weeding is especially difficult and labor-intensive, particularly because no herbicides are yet permitted for use on hemp.

Obtaining proper harvesting equipment can be another difficulty. Specialized farming equipment is needed to harvest CBD hemp on larger farms, and farming combines modified for such work are hard to come by.

Finally, lack of drying equipment is also plaguing some hemp farmers. The two major manufacturers of high-compression baling equipment - which squeezes moisture and oxygen out of the plant material - are currently sold out, according to the northeastern Colorado producer noted above. And some of the drying equipment sold to hemp farmers is not working out as advertised, increasing the potential that a lot of post-harvest hemp will end up damaged or ruined by mold and other moisture issues during storage.

Hemp processors are also requiring dried biomass from growers, which will generate additional headaches for producers who do not have access to drying equipment or humidity-controlled storage facilities.

The processing of hemp into fiber for use in textiles and other products is also creating challenges for market participants. In Minnesota there are no hemp fiber processing facilities, so farmers in that state have resorted to harvesting the fibers while they are still green, using existing equipment intended for traditional crops.

"Hemp is kind of like wire," Todd Frank, a veteran organic farmer in Minnesota's Goodhue County, recently told the Winona Post. "It's a very good substance, but every place on a combine you think it can wrap, it's going to wrap."

Those comments were echoed by a hemp grower in Pennsylvania. "I've personally burned up three combines in the last three-and-a-half to five years, processing ripe material," he told Hemp Benchmarks, "material that's ... at mature stage."

And, as several news reports this year have called attention to, those driving industrial hemp biomass through certain states run the risk of arrest and prosecution under state cannabis laws. The Denver-area processor noted above stated to Hemp Benchmarks that, before moving large amounts of biomass through states unfriendly to hemp, a test run with a relatively small amount will be undertaken first. He said that 500 pounds of biomass being driven from Oregon to Colorado was seized by Wyoming authorities during one such test run.

Federal Regulatory Update



Federal Regulatory Update

Congress remains in recess until early September, yet federal agencies and lawmakers are still working on hemp legalization and regulatory issues.

USDA



Both hemp growers and state agencies are still waiting for the USDA to issue its "Interim Final Rule" for hemp production. As we noted in our report for July, officials stated last month that they hoped to have regulations published by August, but that the rules were undergoing interagency review, which could delay their release.

However, an August 19 report from Hemp Industry Daily calls attention to another delay in the USDA's rulemaking process. According to the report, the USDA "is grappling with the Farm Bill's requirement for a national THC testing protocol." Officials do not have a definitive timeline for the issuance of hemp production rules, but emphasized that they still intend to have them in place in time for the 2020 growing season.

FDA



In late July, a U.S. Food & Drug Administration (FDA) official said the agency was working to speed up its efforts to establish regulations for hemp-derived CBD and would provide an update on its efforts by early autumn.

Then in August, at the National Industrial Hemp Council's 2019 Hemp Business Summit, a top FDA official said the agency sees the "exciting potential opportunities, but also potential risks" of hemp and hemp products, while calling for more research.

In his prepared remarks, Lowell Schiller, the FDA's Principal Associate Commissioner for Policy, noted that consumers "have a right to expect the same level of FDA protection with respect to hemp and derivatives like CBD as they would expect with respect to any other substance." Schiller also acknowledged that last summer the FDA approved a CBD product, Epidiolex, for marketing as a drug to treat some infant seizure disorders.

"We know there's also interest in other potential therapeutic uses of CBD," he continued. "FDA encourages research into such uses. If there were evidence demonstrating that a CBD product meets the drug approval standard for a new indication, and an application were submitted and approved, that would be a big win for public health."

Banking

On August 19, the National Credit Union Administration (NCUA) published new guidance, under which “federally insured credit unions may provide certain financial services to legally operating hemp businesses.”

According to the guidance, “credit unions that choose to serve hemp-related businesses ... need to understand the complexities and risks involved,” and “must have a Bank Secrecy Act (BSA) and Anti-Money Laundering (AML) compliance program commensurate with the level of complexity and risks involved.”

The guidance goes on to state that Suspicious Activity Reports (SARs) must be filed in cases of suspected illegal activity, but are not necessary for lawful operations of hemp businesses. Credit unions serving hemp businesses must familiarize themselves with their state’s laws and regulations so that they can identify activity that could be characterized as suspicious.

Welcome news for hemp businesses is included in the NCUA guidance: “Lending to a lawfully operating hemp-related business is permissible,” it states. However, how many credit unions will issue loans or other types of credit to legal hemp businesses in the near term remains to be seen. The many unknowns of the burgeoning hemp industry could interfere with lenders’ abilities to determine the creditworthiness and ability to service debts of market participants.

Finally, the document concludes, “The NCUA will issue additional guidance on this subject once the USDA’s forthcoming regulations and guidelines are finalized.” Additionally, a footnote in the NCUA’s guidance points out that “certain hemp-derived products may now or in the future be regulated by ... the FDA,” which almost certainly refers to CBD products. This could continue to complicate access to banking for businesses dealing with CBD products, which constitute a significant portion of the U.S. hemp market.

MAKE DECISIONS WITH CONFIDENCE

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Growing Public Acceptance of CBD

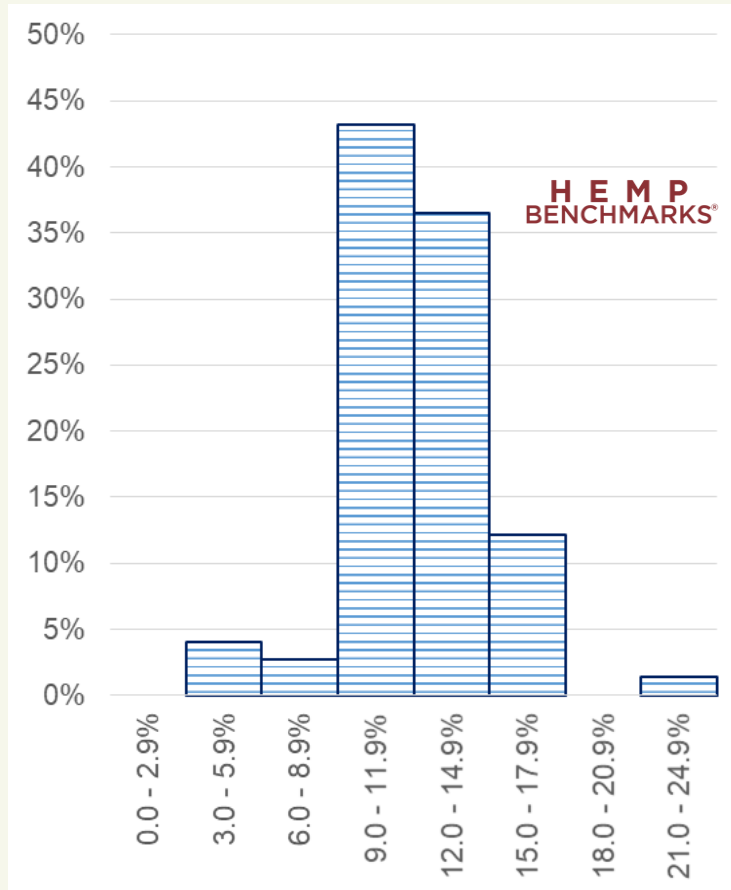
While the FDA moves forward on its regulatory framework for CBD at a measured pace, its use by U.S. consumers appears to be expanding rapidly.

According to a Gallup Poll issued in August, 14% of Americans over the age of 18 - or about one in seven - say they personally use CBD-based products. In contrast, a study released earlier this year by Cowen & Co. estimated that just under 7% of adult Americans currently used CBD.

Gallup said younger Americans and those in Western states are more likely to use CBD products.

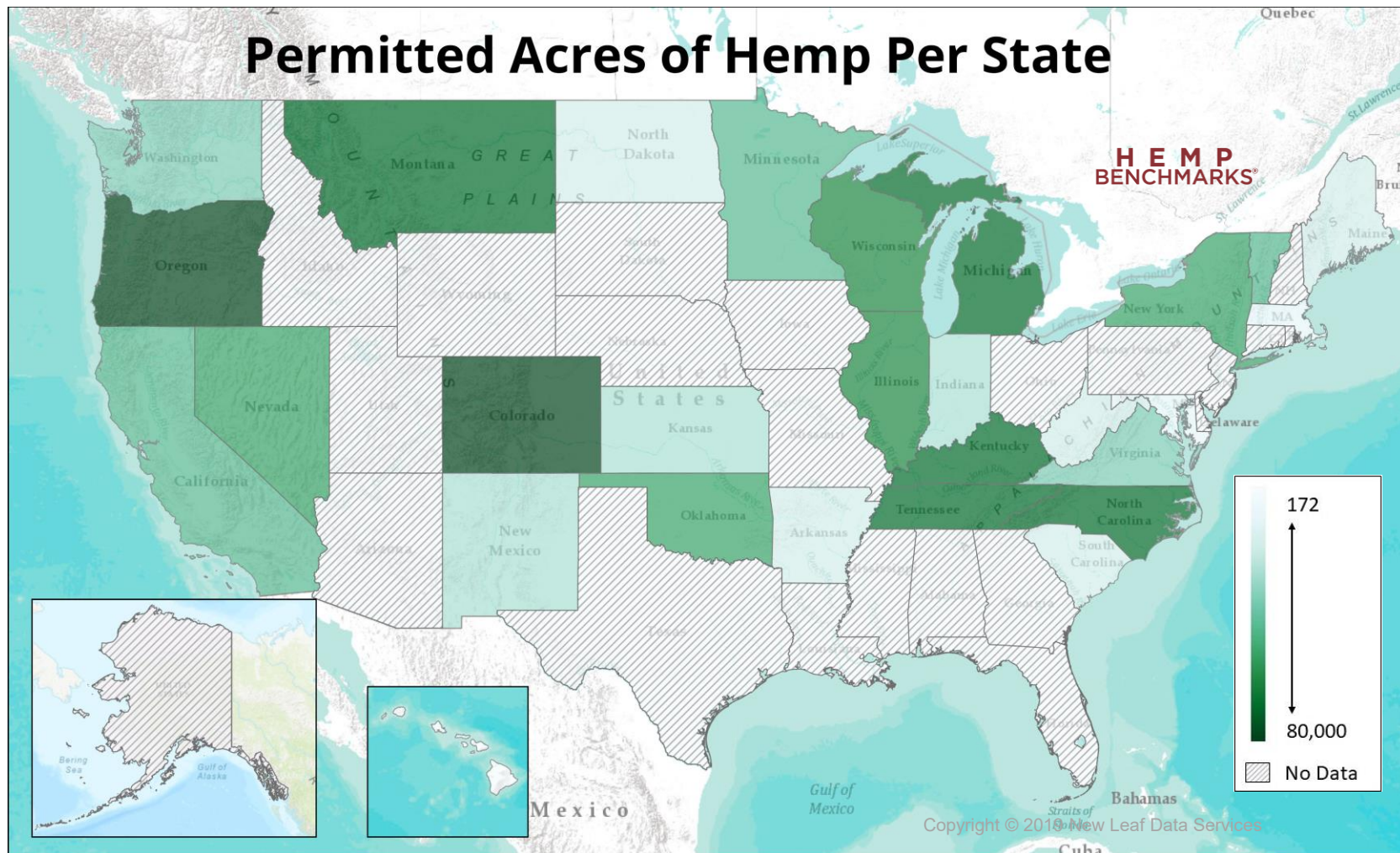
On a regional level, the poll reported that 21% of those in the Western U.S. use CBD products, compared with 13% in the South and 11% in both the East and Midwest. As Gallup explains, "Marijuana use is legal in many Western states, and CBD products have therefore been available for a longer time to residents of those states."

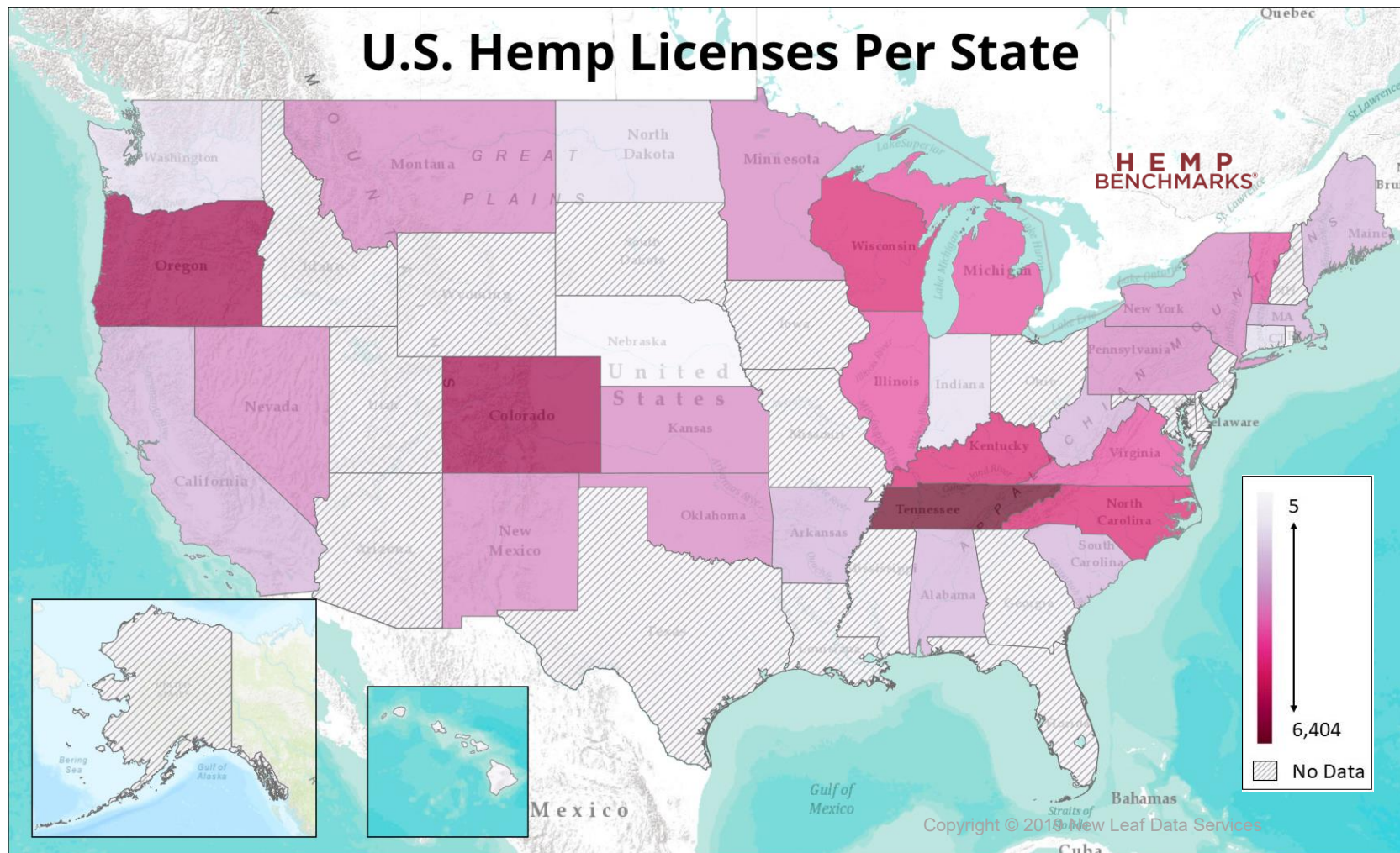
Frequency Chart of CBD% of Assessed Biomass Prices



UNITED STATES COVERAGE

STATE	# of Licenses	Permitted Outdoor Acres	Permitted Greenhouse Sq Ft	STATE	# of Licenses	Permitted Outdoor Acres	Permitted Greenhouse Sq Ft	STATE	# of Licenses	Permitted Outdoor Acres	Permitted Greenhouse Sq Ft
Alabama	205			Louisiana				Ohio			
Alaska				Maine	162	3,000		Oklahoma	225	9,606	
Arizona				Maryland		1,400		Oregon	1,883	61,640	10,156,710
Arkansas	101	3,200		Massachusetts	102	730	147,000	Pennsylvania	323		
California	114	8,862		Michigan	541	32,243		Rhode Island	5		
Colorado	2,554	80,000		Minnesota	314	7,667	681,077	South Carolina	113	3,300	
Connecticut	67			Mississippi				South Dakota			
Delaware				Missouri				Tennessee	6,404	37,432	115,144,316
Georgia				Montana	277	42,000		Texas			
Florida				Nebraska	10			Utah			
Hawaii	30	172		Nevada	207	10,030		Vermont	570	7,800	
Idaho				New Hampshire				Virginia	700	7,000	
Illinois	530	18,860		New Jersey				Washington	85	6,500	
Indiana	60	5,300		New Mexico	269	5,448	6,196,647	West Virginia	158	2,531	
Iowa				New York	267	11,466		Wisconsin	1,247	16,958	
Kansas	203	5,732		North Carolina	1,523	33,908	10,076,710	Wyoming			
Kentucky	1,047	50,000		North Dakota	56	3,212		TOTAL	20,352	475,817	142,402,584





State Updates

Below are updates on developments in industrial hemp and CBD production, market formation, legislation, and regulation at the state level.

Alabama

The state's first legal hemp crop is reportedly growing well and remains on schedule for harvest.

"We've got some really good farmers in the program that we know can grow anything," Alabama Department of Agriculture Commissioner Rick Pate told AL.com in early August. "Most of them think they'll have a crop. There are smart people hoping they can make a little money. With CBD oil taking off, there are plenty of people wanting to buy it."

Harvest for the early hemp plantings is expected to be completed in August, while September should see the majority of hemp harvesting and testing in the state's lab. "If there's a bottleneck, it's in our lab," Pate added. "We've got to get the samples and report back to them so they can harvest. We're expecting September to be our busiest month."

Alaska

Alaska Governor Mike Dunleavy has cut funding for the state's hemp pilot program. According to KTVA, Dunleavy cut the program's \$375,000 budget because, "currently there is no existing industry to support a state funded program."

The pilot program and commercial production of industrial hemp in Alaska were legalized in 2018 when then-Governor Bill Walker signed Senate Bill 6 into law. As the law is currently still on the books, we continue to list Alaska as a state with a commercially legal hemp program for 2020. However, whether state agencies will move to formulate rules and license businesses to populate the industry is in doubt given the actions of the current governor.

Colorado

Officials with the Colorado Hemp Advancement and Management Plan (CHAMP) were scheduled to hold the first of several public meetings in the state in August.

According to the Colorado Department of Agriculture's website, the CHAMP initiative is partnering with state, local, and tribal agencies, as well as industry experts, to regulate, develop, and promote all aspects of Colorado's hemp supply chain.

Hawaii

A report late this month from the Honolulu Star-Advertiser stated that over half of the industrial hemp cultivated this year in Hawaii has been destroyed due to testing "hot," or over the 0.3% THC limit to qualify as hemp. However, due to the fact that Hawaii has only a small pilot program underway, this development will not impact nationwide supplies of biomass or other products.

Kansas

One of the first legal hemp harvests in Kansas took place this month, according to an early August report from KCUR. The report states that a small crop was cut down by cultivators growing indoors.

An early August report from the Wichita Eagle quotes state agriculture department officials as stating that nearly all of Kansas' registered hemp farmers are growing their crops outdoors, although a handful are cultivating indoors or in greenhouses. Regulators estimate that roughly 90% of industrial hemp being grown statewide is for CBD production, with harvests of outdoor crops generally set to occur in September.

In addition to the licensing information for hemp growers in Kansas, shown in the table on page 18, 20 distributors, 34 processors, and nine state educational facilities also received licenses for the hemp program. Kansas also set an 80-acre limit per license, so some growers reportedly hold multiple licenses.

Maine

In Maine, a state law that went into effect on August 1 allows for the production and sale of hemp-derived CBD in the state, so long as the cultivation, manufacture, sale, and consumption of that CBD all takes place in Maine.

The law was described in an early August report from the Portland Press Herald as, "a workaround to allow CBD foods to continue to be sold [in the state] despite a federal ban." The action has been welcomed by Maine hemp farmers.

Michigan

This is the inaugural season for Michigan's industrial hemp pilot program. The state issued emergency rules for the program in mid-August. 389 processor-handlers are registered in Michigan's industrial hemp program, in addition to the information on growers and licensed acreage contained in the aforementioned table.

"This is an exciting next step for the growth of our newest agricultural crop, and with harvest coming up, we needed to provide clear direction for Michigan's industrial hemp growers," Michigan Department of Agriculture and Rural Development Director Gary McDowell said in a press release. McDowell added the emergency rules will be in place for six months and can be extended for an additional six months, if needed, while Michigan awaits USDA approval for a long-term hemp strategy.

Nevada

A mid-August report from News 4, a local NBC affiliate in Nevada, quotes Ashley Jeppson, plant industry division administrator at the Nevada Department of Agriculture, as saying that the state has registered 53 handlers and 37 seed producers, in addition to the information on licensed farmers contained in the accompanying table. The number of businesses populating Nevada's hemp industry has reportedly grown by six times since its inception.

New Jersey

On August 9, New Jersey Governor Phil Murphy signed into law a measure that repealed his state's existing hemp pilot program and established a permanent commercial hemp program. The new law also specifies that hemp-derived products, including CBD, "shall be considered an agricultural commodity and not a controlled substance."

New York

One prominent New York lawmaker sees hemp as an additional opportunity for his state's scientific and agricultural communities. In August, Senator Charles Schumer announced \$500,000 in federal funding was being used to create the nation's first industrial hemp seed bank at Cornell University.

"I fought tooth and nail to secure this federal funding," Schumer, the Senate minority leader, said in a press release, "while also working to strip back the burdensome federal restrictions that held our farmers and growers back from growing industrial hemp as an agricultural commodity, because I knew the potential this crop had to transform the upstate New York economy."

The hemp seed bank will reportedly allow researchers to identify genes for pest and disease resistance, while giving them the tools to breed new varieties.

North Carolina

In our report for July, we noted that a North Carolina lawmaker that had been pushing to ban smokable hemp in the state reversed course and signed on to a measure that will allow its sale until the end of 2020.

However, an August 20 report from the Durham Herald-Sun stated that, under a version of the North Carolina Farm Act that cleared the state House of Representatives, the definition of hemp was changed to exclude smokable plant material, with such material banned as of May 2020 rather than the end of next year. The Herald-Sun report notes that the House-passed version of the legislation must be approved by the state Senate before being sent to the governor for his consideration.

Ohio

Also in our report for July, we pointed out that a bill legalizing hemp was signed into law by Ohio Governor Mike DeWine near the close of the month. Shortly after, on August 1, Ohio's Department of Agriculture planted the state's first legal crop, a test plot consisting of 100 plants of four varieties obtained from a Kentucky hemp business, according to the Cincinnati Enquirer. Commercial production is expected to begin in 2020 and the Enquirer report states that interested farmers will be invited to visit the agriculture department's hemp field.

South Carolina

Several stores were raided and CBD products seized last month in South Carolina, according to a July 29 report from the Greenville News. The raids came several days after the state Attorney General's Office issued an opinion in response to an inquiry from the South Carolina Law Enforcement Division (SLED) regarding the state's Hemp Farming Act.

"It appears that this bill makes the possession and storage of unprocessed or raw hemp plant material by certain individuals in South Carolina without a license unlawful," according to the opinion.

But the raids confounded some commercial hemp retailers. "It was a big surprise to us," one of the affected store owners told the Greenville News following the hemp raid. "They're lumping it in the category with marijuana, but the South Carolina Department of Agriculture defines it as scientifically a different plant."

The South Carolina Attorney General's office issued another opinion in early August, suggesting that the state's department of agriculture, working with SLED, should "promulgate regulations to address the omissions identified in these opinions."

Washington State

The Washington State Department of Agriculture (WSDA) provided an update at the beginning of this month on "Restrictions on the Use of Hemp CBD as a Food Ingredient." The bulletin begins, "To be clear, CBD is not currently allowed as a food

ingredient, under state and federal law."

Further on, it notes that WSDA is authorized to regulate the processing of hemp for food products and that if the FDA approves food ingredient uses for hemp extracts like CBD, those uses would be allowed under state law. At the moment, however, CBD "cannot be used as a food ingredient under a Washington State Food Processor License. Foods containing unapproved parts of the hemp plant [including CBD] may not be distributed in Washington State under a Washington State Food Storage Warehouse License."

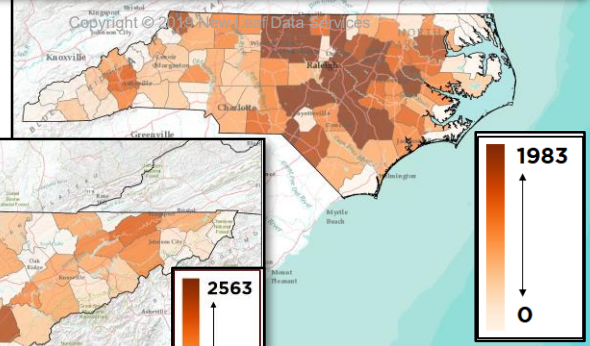
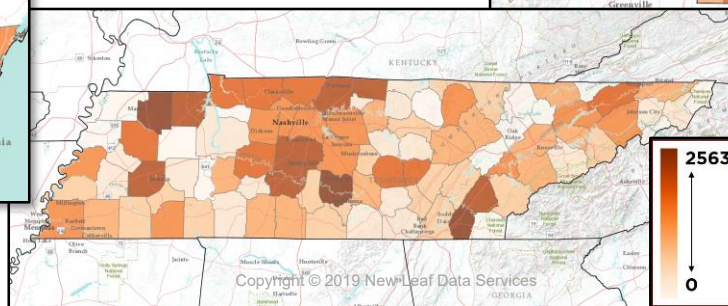
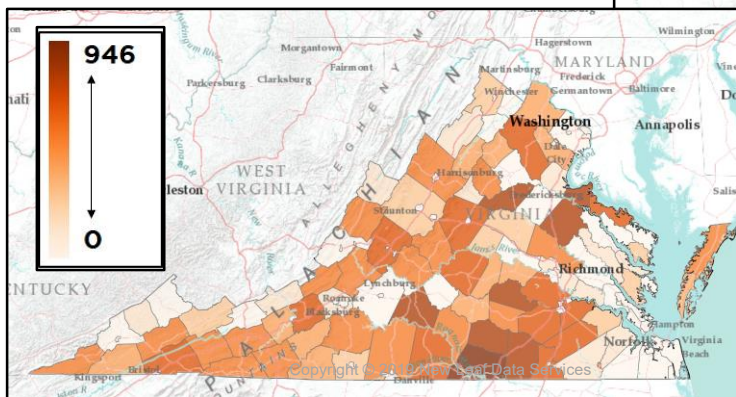
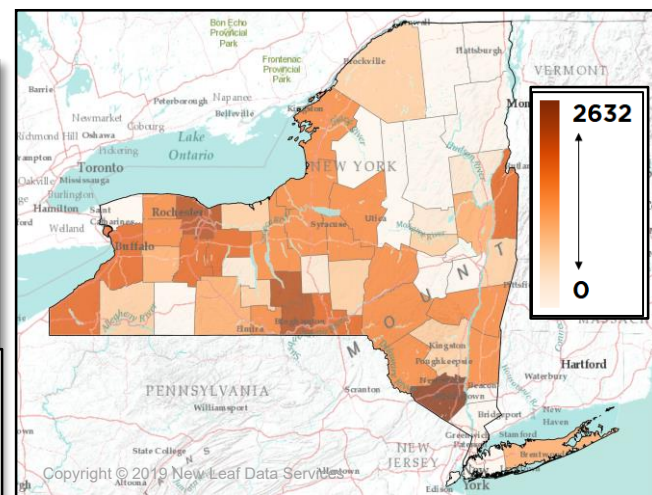
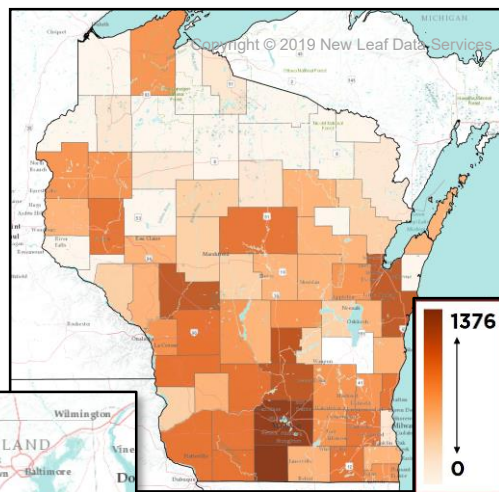
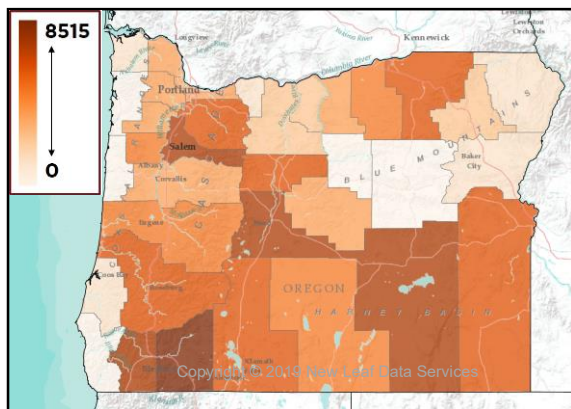
***CORRECTION:** The "U.S. State Hemp Program Status" map on page 2 of the Hemp Benchmarks July report listed Hawaii's status as "2020 Commercially Legal." Hawaii currently has an industrial hemp pilot program under the terms of the 2014 Farm Bill, but Governor David Ige last month vetoed legislation that would have authorized commercial hemp production in the state. Therefore, Hawaii's hemp program status has been changed to "2019 Pilot Program" in the map included in this report. We regret the error.*

H E M P BENCHMARKS®

U.S. Wholesale Hemp Price Benchmarks

August 2019

2019 GROWING ACRES BY COUNTY



Sources: Oregon Department of Agriculture, Tennessee Department of Agriculture, Wisconsin Department of Agriculture, New York Department of Agriculture, North Carolina Department of Agriculture, Virginia Department of Agriculture, Hemp Benchmarks

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PRODUCT DEFINITIONS

BIOMASS

Dried hemp plant materials including the stalks and leaves that may include flowers/buds and/or seeds that have been harvested. Free of mold, grit, minimal (< 0.1%) non-hemp organic matter, and at least 80% dry. An industry-wide acceptable moisture content is necessary to establish uniform pricing for hemp biomass. Any hemp biomass material that is above the standard moisture content will result in decreased value and an adjusted sale price to reflect a lower volume of the end product to account for further water evaporation. Biomass can also be milled, ground or pressed into pellets.

DRIED CBD FLOWER

Dry flower is the dried flower and bud fraction of a hemp plant that has been removed from the stalks and contains minimal stems. Flower is suitable for smoking and for use in pre-rolled joints.

HURD (Decorticated)

Hemp stalks are stripped of the outer bark/shell/skin of the stalk using a decorticator, ranging from hand-cranked to automated electric processing. The removal of the hard outer bark/shell/skin of the hemp stalk exposes the fiber core of the plant which is then readily usable for production.

HURD (Non-Decorticated)

Hemp stalks with the outer bark/shell/skin intact. The hemp stalks may or may not have gone through a retting process that allows microbes and moisture to break down the stalk, making the fiber easier to remove.

CLONES

A clone refers to a plant that is an exact reproduction of an original parent plant, known as a mother plant, through asexual propagation. A clone is made by taking a stem cutting (or tissue culture) from a mother plant and placing the cutting into media to facilitate root growth. Once the roots begin to grow, the clone is transplanted into a field or cultivation facility.

INDUSTRIAL SEEDS

Industrial hemp seeds comprise a broad range of hemp cultivars used to grow hemp biomass, hemp seed and grain for food oils and food products, and fiber for woven and non-woven applications.

CBD SEEDS (Non-Feminized)

Hemp plants that are pollinated naturally or with traditional breeding techniques produce both male or female seeds. These are known as regular, or non-feminized, seeds and generally result in an even split between the two sexes.

CBD SEEDS (Feminized)

Feminized seeds are seeds that have been modified to produce almost 100% female plants. There are a few techniques that can produce reliably feminized seeds. Feminized hemp seeds can be genetically modified to produce only female plants by eliminating the X chromosome. A non-genetic technique is to stress a healthy female plant by interrupting its light cycle during flowering. Another common and controlled method is to spray female plants with a colloidal silver or silver thiosulphate solution.

CRUDE HEMP OIL

Crude hemp oil is extracted from the hemp plant and contains all of the cannabinoids, terpenes and other plant compounds found in the biomass. Processors use a number of different methods to extract crude oil from hemp. Supercritical CO2 extraction uses pressurized carbon dioxide (CO2) to pull CBD (and other phytochemicals) from the plant. Solvent extraction uses ethanol or hydrocarbons, such as butane or propane, to process hemp biomass into crude oil. Other processes use olive oil or water as a solvent.

Crude hemp oil is often "winterized." Crude oil is winterized to remove organic plant compounds, such as lipids, waxes and chlorophyll, that increases the potency of the oil and creates a more transparent distillate.

REFINED HEMP OIL

Crude hemp oil is further refined through distillation to produce refined hemp oil, which includes full spectrum oil and broad spectrum oil.

CBD full spectrum oil distillate is refined hemp oil extract that contains all the compounds found naturally occurring in the plant, including all the cannabinoids, terpenes and essential oils.

CBD broad spectrum oil distillate is refined hemp oil extract that includes all the compounds found naturally in the plant, except broad spectrum oil has been processed to remove all or substantially all of the THC.

CBD ISOLATE

CBD isolate is the purest form of CBD, which is produced by removing all other compounds found in the plant including terpene, flavonoids, plant parts and other cannabinoids. CBD isolate comes in a granular or powder form and is odorless and tasteless. The end product contains 0% THC and is made up of 96% to 99.9% CBD.